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GENERAL NOTE.

Owing to the current nature of the investigations mentioned in the Technical News Bulletin, sometimes it will be impossible to supply printed information regarding them. However, in these cases, when the investigation has progressed sufficiently far, the Bureau will be pleased to furnish technical data to those engaged in the particular application of the subject, in order to avoid the delay incident to publication.

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1 Inter-Laboratory Comparison of Electrical Instruments

During the past month the Bureau has cooperated in a comparison of the standards of the various laboratories of one of the largest electrical manufacturing concerns in the country. This company has laboratories in a number of cities of the United States and a set of instruments for measuring electrical current, voltage, and power was carried from one to another of these laboratories, and to the Bureau of Standards. The instruments were carefully checked against the working standards of each laboratory. The results show a very gratifying agreement between the various plants and indicate that the standards in use by the electrical industry at large, so far as they are affected by this manufacturer, are satisfactorily uniform. The tests have also been of value in showing that the different types of instruments tested maintain their accuracy under various conditions of transportation.

2 Magnetic Properties of Eutectoid Steel

A study is being made in connection with the development of magnetic analysis of the correlation between the magnetic properties and the structure and other physical properties of steel.

Special attention has been paid so far to a simple carbon steel of eutectoid composition. An investigation has just been completed on the effect

of rate of cooling on the magnetic and other properties of an annealed eutectoid carbon steel and a paper describing this investigation has been prepared.

It was found that the magnetic properties are very considerably influenced by variation in the rate of cooling from above the critical range and corresponding variations are produced in the microstructure. There was also found to be a marked agreement between the values of coercive force and the scleroscope hardness.

3 Condenser Antennas

Experiments have recently been made upon a special type of antenna for transmission and reception of radio signals. The antenna consists of a pair of metal plates. It is thus similar to the ordinary antenna arrangement, the wires of the ordinary antenna corresponding to one plate of the condenser antenna and the ground below the wires corresponding to the other plate of the condenser antenna. When the lower plate of the condenser antenna is on the ground, the two types are practically identical. It is found, however, that raising the lower plate from the ground improves the signals. This type of antenna has the advantage that it is not subject to disturbances and irregularities produced by objects on the ground.

The work done included the construction of various forms of condenser antenna and measurement of the capacity and other electrical properties. This type of antenna was compared with coil antennas which are used as direction finders. For the very short wave lengths, such as are used in radio communication by amateurs, the condenser antenna gave more intense signals than the coil antenna of the same general dimensions. Compared with the ordinary antenna with which a ground connection is used, the condenser antenna is markedly free from electrical disturbances.

4 Tests of Length Measuring Devices

The work of the section devoted to linear measurements possesses much greater variety than would ordinarily be supposed. During the past month the following articles were tested by this section: 26 steel tapes; 8 invar tapes; 40 "metallic" tapes; 25 haemacytometers complete; 23 haemacytometers, sizes of squares only; 33 sieves; 8 capillary tubes; 2 section disks; 1 gasoline measuring pump, and 1 invar

tape was also graduated. The "metallic" tapes tested were of the Chesterman type made in England and were carefully examined to ascertain in what respects they differed from tapes made in this country. It was found that the construction was practically identical, the metallic feature consisting of thin tinsel wound around some of the longitudinal threads. In testing the sieves, it was found that there was a distinct tendency toward very large shoot wires. Many of the sieves were rejected because the large wires had not been compensated by more open weave.

5 Weighing Automobile Parts to Determine Amount of Wear

Some rather interesting work has been undertaken for the Motor Transport Corps in connection with their experiments on the deterioration of automobile parts in service. A number of bearings and gears have been accurately weighed on the Bureau's balances and have been placed in cars in service. After a certain length of time these parts will be returned to the Bureau and re-weighed, the difference in weight representing, of course, the loss in metal due to wear.

6 Investigation of Haemacytometer Chambers

Recently considerable variety of haemacytometer chambers has been on hand for test at one time thus affording an opportunity of studying the character of the lines when dry and when under a solution and also of the contact between the cover glass and the supporting surface of the slide. This investigation is not yet complete but certain facts have been brought out, among them being that a difference of the character of the lines is found under the two conditions.

7 The Popping of Lime Plaster

An article on the popping of lime plaster prepared by the Lime Section has recently been issued by the American Ceramic Society. This common fault of most plasters is described and methods for avoiding the difficulty are indicated. Other publications on lime and gypsum will be issued in the near future.

8 A New Stain for Indian Pottery

As mentioned in a previous Bulletin, the Bureau has endeavored to aid the Hopi Indians in the manufacture of pottery. During the past month this work has been continued by the preparation of a black stain from cheap material in a simple manner which is much superior to the one at present so largely used by the Indians. In addition to the request from the Hopi Indians for aid in making pottery, the Bureau has lately received a similar request from the Zuni Indians of New Mexico.

9 Terra Cotta Investigation

Rods for thermal expansion determinations have been made from 7 different glazes and 10 underslips. The thermal expansion of clay specimens has been determined and work is now in progress on the underslips. Bars for transverse strength have been prepared from 14 bodies, 7 of which were cast, the purpose being to determine the difference in strength of the pressed and cast wares. The transverse strength tests have been made on 4 sets of sample bars submitted by as many different terra cotta companies. The results show that the transverse strength is greater when the bars are tested with the glazed side up which indicates that the tensile strength of the body is greater than that of the glaze.

10 Frits for White Ware Glazes

In this country white ware glazes are made with the use of a considerable amount of fritted material of which boric acid, feldspar, and whiting are the most important constituents. For the most part these frits are made by the crude and expensive method of firing the saggers in pottery kilns, while in a few plants they are melted in special frits kilns. A special investigation has been undertaken of various mixtures of feldspar, boric acid, and whiting to determine the most satisfactory mixture of these materials for use in white ware frits and also to discover the most economical and efficient method of their manufacture.

11 The Fish Scaling of Ground Coat Enamels

The study of the cause and control of fish scaling of ground coat enamels has been continued, by the preparation of two series with a total of 14 enamels, in one series the feldspar being high, while in the other the quartz is high. In each series the fluxes are varied in a systematic manner. The results obtained thus far agree with those for gray ware enamels, that is, the constituents which tend to promote or retard fish scaling has the same results in the two types of enamels. Furthermore, it was found that there was little tendency to fish scale in three-coat enamels applied to low copper steels which agrees with the results obtained with one-coat enamels. The determinations of the thermal expansion of various types of enamels used for coating sheet steel are being continued.

12 Recent Ceramic Publications

The following publications dealing with Ceramic work have appeared:

The Rate of Vitrification of Porcelain

Molded under Different Conditions by R. F. Sherwood, the October number of the Journal of the American Ceramic Society;

The Post-War Status of the Ceramic Industry, A. V. Bleininger, Chemical and Metallurgical Engineering, September 29, 1920;

Enamels for Sheet Iron and Steel by Prof. J. B. Shaw, Technologic Paper 165 of the Bureau of Standards.

13 Research Work in Electro-Deposition

During the month a member of the staff attended the semi-annual convention of the American Electro-Chemical Society, at which a few papers dealing with electro-deposition were read and discussed. As the result of an informal conference at that convention, arrangements have been made for the assignment of one or more graduate students in Ohio State University to research work in connection with electroplating. This work will be carried out in cooperation with the Bureau of Standards. It is believed that wherever possible such arrangement should be fostered in order to increase the amount of research work in this field and to render the Bureau available in some degree as a clearing house for information on this subject.

14 Bearing Metals

Experimental work on determining the compression and hardness values of white metal bearing alloys at temperatures up to 100°C has been completed. A paper has been prepared entitled "Some properties of White Metal Bearing Alloys at Elevated Temperatures", a summary of which is as follows: An apparatus is described for determining the yield point and ultimate strength of white metal bearing alloys at temperatures up to 100°C. A new design of heating apparatus is described for determining the Brinell hardness of such metals in the range of temperature indicated above. The results of compression tests and Brinell hardness tests at temperatures up to 100°C are given for five typical white metal bearing alloys, including three tin base alloys, one lead base alloy, and one intermediate alloy. These tests showed that the tin base alloys maintain their properties better at elevated temperatures than those containing lead. Results of tests are given which indicate that up to 3% the lead in a high grade babbit does not affect the yield point or ultimate strength at 25°C or 75°C. Tests are described which show that the yield point of tin base alloy is not affected by heating for six weeks at about 100°C but that the yield point is lowered in the lead base alloy by heating for only two weeks at this temperature.

15 Thermal Stresses in Steel Car Wheels

An investigation to determine the stresses in steel car wheels, similar to the work recently completed on chilled iron wheels, has recently been undertaken and tests on six of the wheels were completed during the month.

16 Preparation of Magnesium Oxide

A very satisfactory and economical change has been made in the process of preparing magnesium oxide from epsom salts. The method used commercially to produce magnesia has been successfully applied to the calcination of small charges. The magnesium oxide, practically free from sulphur, is electrically calcined, in large part actually fused in an electric resistance furnace similar to those used for the production of carborundum, that is, the magnesium oxide is packed about a small carbon rod between two large carbon electrodes set in the end of a box-like concrete shell lined with zircite. The electric current first heats the small carbon rod to a temperature which fuses the magnesium oxide with which it is surrounded. This fused magnesium oxide then has greater conductivity and the cross-section of this core of the fused material gradually increases to the end of the run. A run in one small furnace takes about 30 minutes and a fused core of about 15 to 20 lb. of pure magnesium oxide is produced.

17 Metallurgical Publications, etc.

The following articles dealing with metallurgical work have appeared during the month:

Physical Properties of Arc-Fused Steel, H. S. Rawdon, D. C. Grosbeck, and L. Jordan, Chemical and Metallurgical Engineering, October 6, 1920;

Notes on Electric Welding, Mechanical Engineering Journal, October, 1920.

The Chief of the Metallurgical Division recently addressed the Engineers' Club of Philadelphia on the subject "The Bureau of Standards and its Engineering Contacts" and also spoke on "The Metallurgical Work of the Bureau of Standards" before the American Heat Treaters Assocuation at Bethlehem, Pa.

18 The Use of Smoked Charts for Recording Instruments

In connection with the investigation of recording instruments used in aeronautic work, numerous tests have been conducted on the various methods of making a permanent record of the readings of the instrument. In many respects the smoked chart method is to be recommended; the principal difficulty with this

system of recording being the securing of a permanent record and one which can be duplicated. Only the ordinary handling of a smoked record incident to examination will injure the same. A satisfactory method of preserving these charts has now been discovered and consists in the proper application of a mixture of alcohol, white shellac, and glycerin. After immersion in this solution, the chart is prepared for blue printing by placing it in a bath of oil and then drying it.

19 The Behavior of Bourdon Tubes

Considerable work has been done in the past on the behavior of Bourdon tube gages but there seems to have been comparatively little investigation on the characteristics of the tube itself. As many aeronautic instruments use tubes of this kind as a part of their mechanism, it has seemed advisable to conduct an investigation of their characteristics, including a study of the hysteresis effects. An apparatus has been set up in which an optical lever system is used for the exact determination of displacement under varying conditions. It is hoped that the work may be extended to include the effect of temperatures on the performance of the tubes.

Respectfully,

S. W. STRATTON

Director
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